

Using Wind Power to Hedge Large End-Users' Electric Bills

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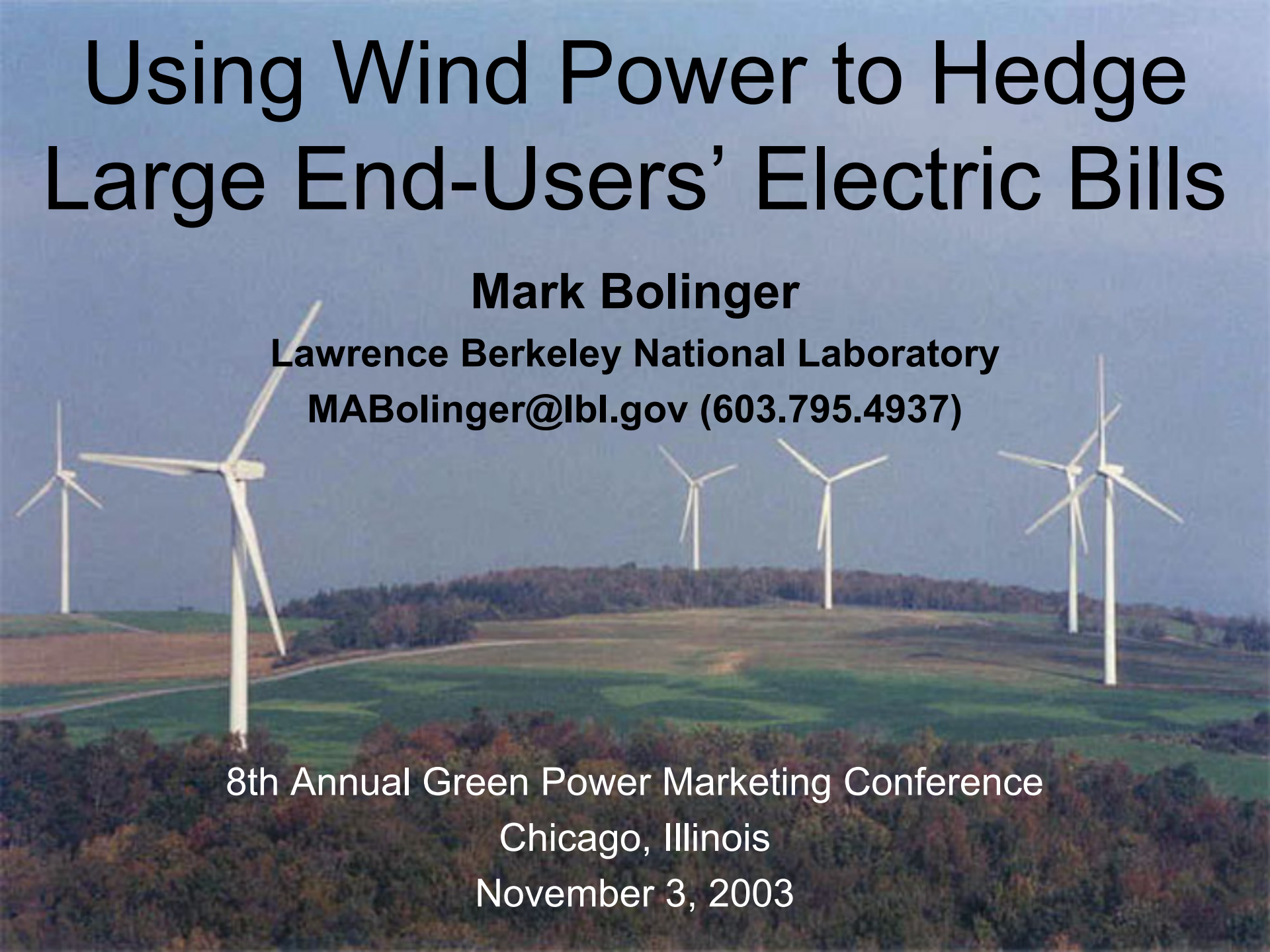
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“Using Wind Power to Hedge Volatile Electricity Prices for Commercial and Industrial Customers in New York”

- by Mark Bolinger, Robert Grace, Douglas Smith, Ryan Wiser
(with Arthur Freitas and Michael Tennis)
 - www.nyserda.org/energyresources/WindHedgeFinalcomplete.pdf
 - New York case study motivated by:
 - + Price volatility in NYISO electricity markets
 - + Limited green power activity in restructured NY market
 - + Scarcity of creditworthy wholesale wind buyers (2 of 3 existing commercial wind projects sell power into spot market)
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- = Desire to investigate feasibility of retail product that addresses all three issues (i.e., reduces volatility, boosts green power market, supports wind projects)

Questions we asked...

- What are the advantages of a wind hedge, relative to conventional hedges?
- How would a retail wind hedge product be structured?
- Is there any experience with offering wind hedge products?
- What challenges face wind hedge products?
- How effective might a wind hedge be in NY?

Advantages of Retail Wind Hedge

- Longer-term hedge than typically available; long-term alternatives have high transaction costs
- Wind hedge may be less susceptible to credit risk or nonperformance concerns than conventional hedges
- A third revenue source for wind generator:
 - 1) Commodities (energy/capacity)
 - 2) Green attributes
 - 3) *Hedge value*

Two Wind Hedge Product Structures

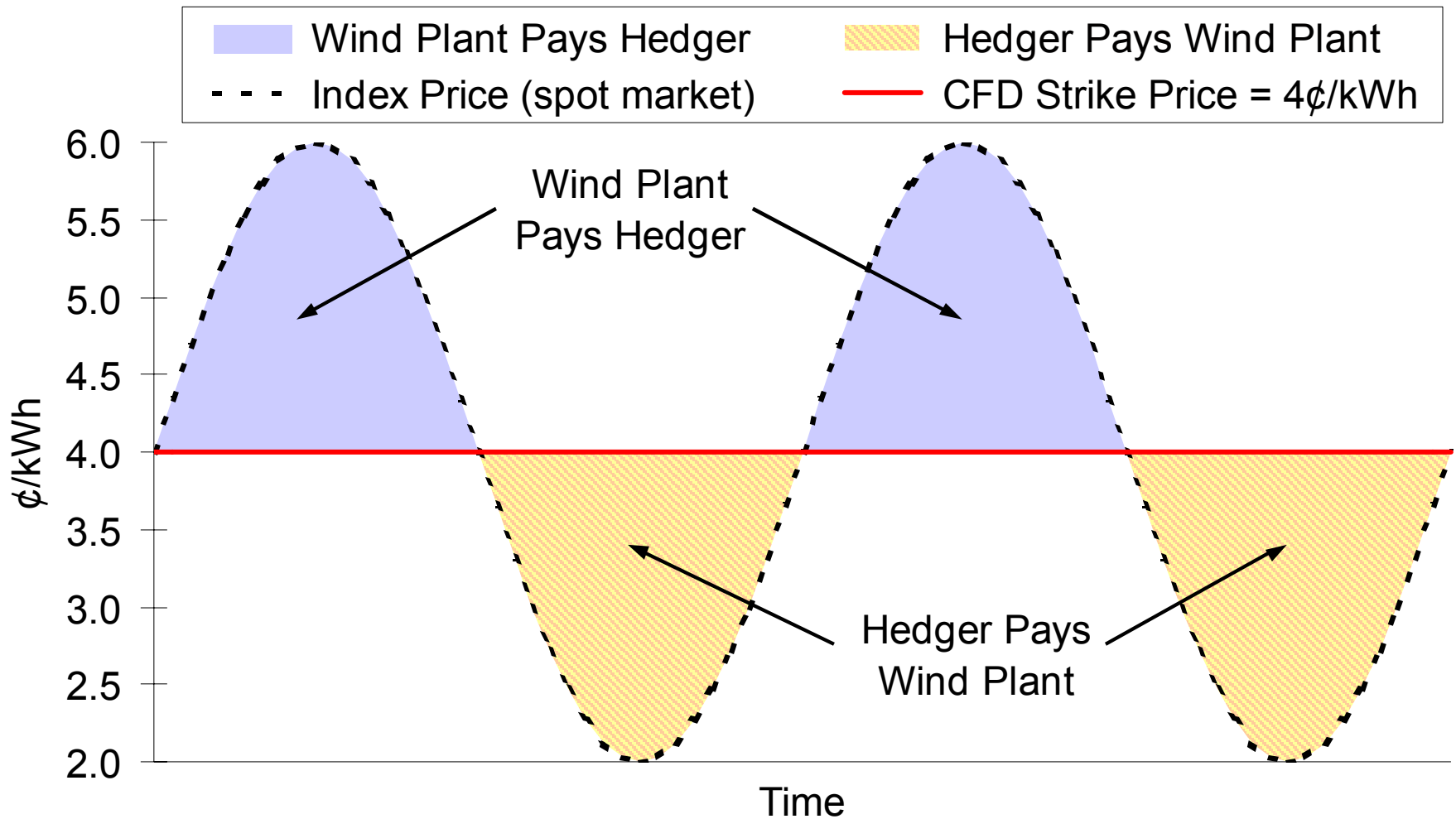
1) Bundled Electricity Service:

- **Fixed-price electricity** from utility or ESCO, who purchases wind power (with or without green attributes)

2) Financial Contract-for-Differences (CFD):

- **Floating-price electricity** from utility or ESCO, combined with financial **CFD** between wind plant and end-user
- Variable payments = difference between spot market index and negotiated “strike price”
- Perfect hedge for wind generator **if** it sells energy into spot market to which CFD is indexed
- Will never be perfect hedge for customer, because of varying load and production mismatch
- No need to switch providers

Structure of a Wind CFD



Industry Experience with Wind Hedges

Regulated Markets:

- see Lori Bird's presentation

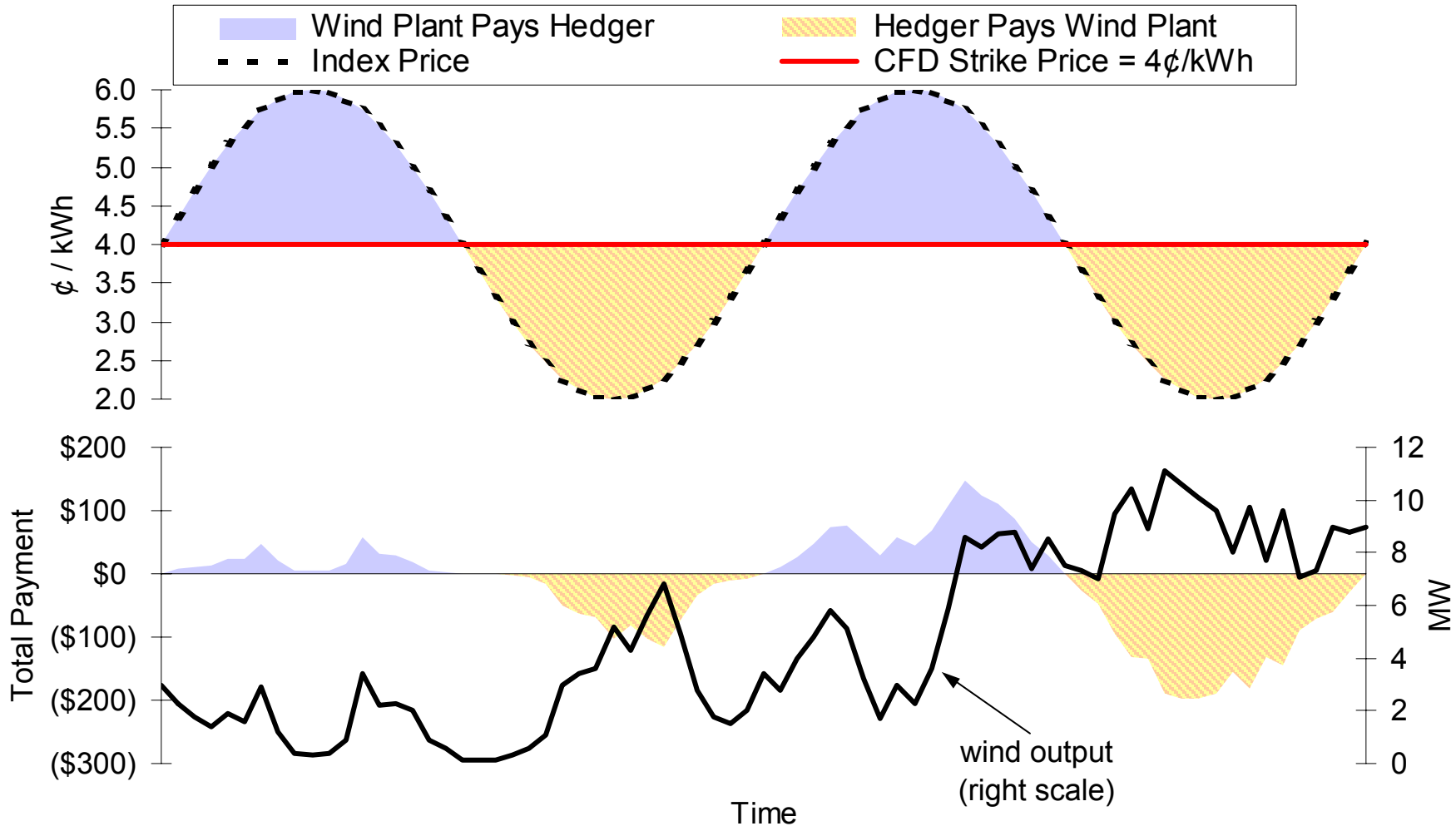
Competitive Markets:

- Little or no success offering a long-term hedge that benefits **both** wind generators & end-users...
- Green Mountain Energy
 - Breath Easy (CA) & Reliable Rate (TX)
 - 1-yr fixed price, achieved by *conventional* forwards and TRCs
- Community Energy
 - Has sold fixed-price wind TRCs up to 10 years
 - Exploring CFD hedge offering

Six Challenges to Wind Hedge Products

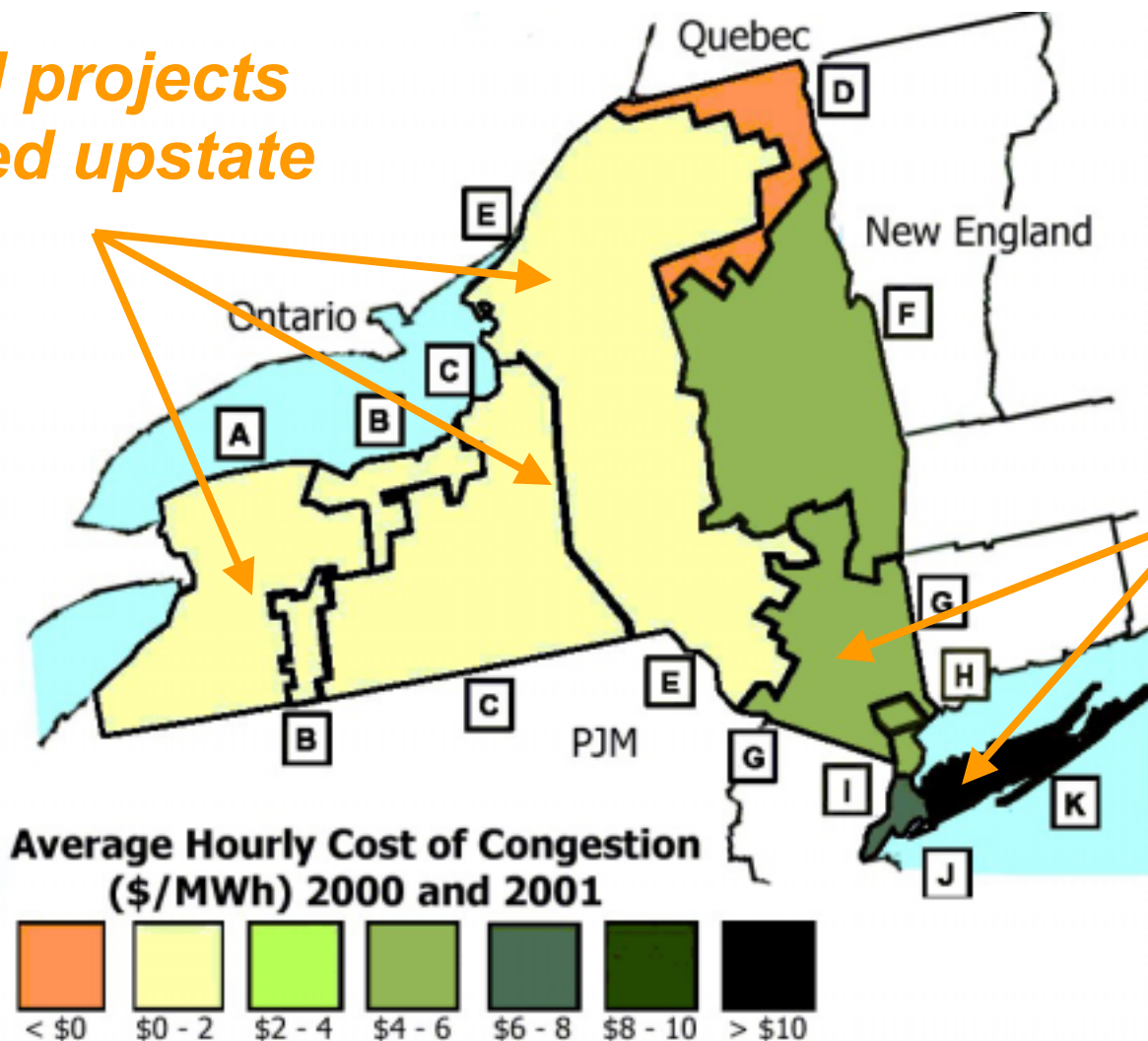
- 1) Customer resistance to long-term contracts
- 2) Customer resistance to switching suppliers
- 3) Credit risk
- 4) Lack of retail rate volatility
- 5) Wind intermittence and production/load mismatch**
- 6) Locational basis difference between wind generators and customers**

Intermittence Erodes Hedge Value



Congestion May Affect Hedge Value

*Wind projects
located upstate*



*Load (and
high prices)
located
downstate*

Analysis: How Good is a Wind Hedge?

Data & Assumptions:

- ⇒ 1 year of production data from Western NY wind plant
- ⇒ 32 months of NYISO spot prices (5/2000 – 12/2002)
- ⇒ Two different customer load shapes:
 - 1) High (85%) load factor (e.g., 3-shift industrial), no seasonality
 - 2) Aggregate NYISO load shape
- ⇒ Two different customer locations:
 - 1) Western NY (same zone as wind plant)
 - 2) New York City (transmission constrained zone)

Analysis: How Good is a Wind Hedge?

Five Scenarios (5/2000 – 12/2002):

1. ***Spot (unhedged)***: the “do nothing” approach
2. ***100% wind hedge***: annual wind volume set to match annual usage
3. ***50% wind hedge***: annual wind volume set to match 50% of annual usage
4. ***Wind + summer forward***: wind volume sized to match winter usage, augmented with conventional “block forward” to match summer shortfall
5. ***Conventional forward contract (no wind)***: the benchmark – a conventional “block forward” sized to match the customer’s annual average load

Answer: Imperfect, yet Effective

Coefficient of Variation (stdev/avg) of Monthly Average Price

<i>Wind Plant Location:</i>	Western NY	Western NY	Western NY
<i>Customer Location:</i>	Western NY	Western NY	NYC
<i>CFD Indexed to:</i>	Western NY	Western NY	Western NY
<i>Customer Load Profile:</i>	"Flat"	NYISO Avg	"Flat"
<i>Spot (unhedged)</i>	19.2%	18.6%	20.2%
<i>Spot + 100% Wind Hedge</i>	9.0%	9.8%	12.3%
<i>Spot + 50% Wind Hedge</i>	9.8%	10.0%	N/A
<i>Spot + Wind + Summer Forward</i>	3.3%	3.9%	N/A
<i>Spot + Year-Round Forward</i>	1.8%	N/A	N/A

- Sizing the hedge to match winter load is a sound strategy
- Adding summer forward block hedge greatly enhances wind hedge
- CFD indexed to generator's LBMP provides reasonable hedge for customer (almost as good as if in the same zone!), perfect hedge for generator

Conclusions

Wind can provide a reasonably effective – though imperfect – retail electricity price hedge:

- May be particularly effective against:
 - 1) Broad market price changes (*e.g., caused by gas price trends or environmental compliance costs*)
 - 2) Price changes correlated with wind output (*e.g., in NY, winter price spikes*)
- Value increases over longer term (where few if any cost-effective alternatives exist)
- In NY, added hedge value may reduce “green premium” needed to support wind power